ON THE ETIOLOGY OF TRACHOMA.

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I. INTRODUCTION.

The importance of a study of this disease cannot be overestimated on account of the widespread suffering and inefficiency which have followed in its trail, from time immemorial. Within recent years it has been brought more to the notice of the British people by the Reports of the Royal Commission on Alien Immigration. Trachoma is imported into England, by and is found chiefly among aliens and their offspring. At the beginning of the last century it received great attention on account of its prevalence in those European armies that happened to be stationed in Egypt.

The word Trachoma is derived from the Greek word τραχύς = rough, uneven, so called from the character of the conjunctiva. The term was first employed by Pedanius Disconides in 60 A.D., though not in the specific sense in which it is used to-day.

In later times dating from Bonaparte's expedition into Egypt, it was recognised as a distinct infectious and contagious disease and new terms for the disease arose, e.g. ophthalmia Egytica, ophthalmia purulentia chronica, ophthalmia militaris seu bellica, conjunctivitis granulosa.

When Napoleon I landed in Egypt in 1798, most of his soldiers were attacked with this disease, and on their return to Europe, were supposed to have brought with them the disease which was formerly thought to be confined to that country alone. But subsequent researches have shown that the disease had already been endemic in Europe from antiquity and that it was and is now equally prevalent in all Eastern countries including Northern and Western China and Japan.

That the disease was an extremely contagious one is shown by the serious results that occurred in the 52nd Light Infantry; according to Dr. Vetch's account, out of a strength of 700 men there were 600 cases of ophthalmia. Of these 50 were discharged with loss of both eyes and 40 with loss of one. It became so serious in the army that the Commander-in-Chief in 1810 issued orders for the purpose of preventing and reducing contagion to a minimum. Men were not allowed to wash their faces in the same basin or water, or to use the same towels, but were obliged to wash in running water and each man was to be provided with a towel for his own use. Those suffering from ophthalmia were to have specially marked towels, washed and stored apart from the rest.

DEFINITION.

Trachoma may be defined as a specific contagious form of conjunctivitis, extremely chronic, lasting months and years and when left to itself, causing serious and permanent impairment of vision and frequently even total blindness.

In the early part of last century very little was known of the pathological anatomy and the various forms in which military ophthalmia appeared were never analysed clinically or bacteriologically. Blenorrhoea and trachoma were frequently confused by observers.

In the present thesis I propose to give an account of the most recent work on the subject and to record the results of my own personal investigations at the Royal London Ophthalmic Hospital.

HISTORICAL OUTLINE.

Most observers regard Egypt as the birthplace of this disease. In Ebers' Papyrus[1], 1553-1550 B.C., the oldest book on medicine, ophthalmic prescriptions make up about a tenth of the whole collection. Ebers who discovered the manuscript in 1872, in the necropolis of Thebes, proved that the Egyptians recognised the

condition of "blear eye" or "watery eye." Hirschberg[2] is of the opinion that the expression means affections with considerable secretion, like chronic granular inflammation of the lids, so one may infer that Trachoma was present in Ehypt in those times, though there is no evidence to show it became pandemic before the end of the Middle Ages. According to Rust[3] no mention is made of the disease in the history of the Crusades, nor do the Egyptian physicians refer to it. Abdul Latif[4] a celebrated physician, who lived in Cairo about 1200 A.D., does not mention Egyptian ophthalmia in his writings. Meshullam ben Menachem in 1481, mentioned that most of the inhabitants of Egypt were afflicted with eye diseases, and Prosper Alpinus,in 1584, states that Egyptian ophthalmia was pandemic in Cairo at that time. There are no writings to show that Trachoma was not present in India and China at the same time as in Egypt. There is sufficient proof that Trachoma was well known and present amongst the Greeks and Romans (455 - 387 B.C.)

Hirschberg[5] infers that in Athens, owing to the long siege during the Peloponnesian war (431 - 404 B.C.), and the overcrowding of people between walls, that Trachoma increased in frequency and severity. According to Hirschberg[6] one Cornelius Celsus who lived in Rome in the time of Christ, gives an accurate description of Trachoma, which he calls "Aspritudo".

An account of Trachoma is also given by Scribonius Largus (43 A.D.) and amongst later writers by Marcellus (380 A.D.) and Cassius (447 A.D.).

Ebbe[7] came to the conclusion that Trachoma in ancient times was a familiar and very common disease, not only in Hellas proper, but also the countries of the Roman Emperors, bordering on the Mediterranean Sea.

In the Middle Ages the Arabian physicians described Pannus, which they called Shebel or Sebel. In more modern times Trachom (Asperitudo) is mentioned by Ambrose Paré, Pannus by Pierre Franco (1561) and both Trachoma and Pannus by George Bartisch, the author of the first German book on ophthalmology, 1583. The English physicians in the eighteenth century referred to the condition as "Mulberry eyelid."

During the expedition of Napoleon Buonaparte in Egypt 1798, Trachoma spread with such virulence that it was one of the chief agents in lessening the efficiency of his fighting force. In 1801 when the troops moved towards Alexandra the disease spread with such rapidity, so that in 2½ months 3,000 men were attacked[8] and in a short time two-thirds of the French troops fell victims. The English troops, which landed at Aboukir in Egypt, in 188 were almost all attacked by Trachoma.[10]

English physicians were the first to draw attention to the fact that Egyptian ophthalmia is contagious

and produced charges in the conjunctiva of the lids, so as to resemble the villi of the small intestine in colour and appearance. Vetch[11] in 1807, gave typical pictures of the granulations.

After the evacuation of Egypt in 1803, the English Army was disbanded, and spread the disease wherever the troops landed, i.e. at Malta, Sicily, Gibraltar, Portugal and Spain. The disease also appeared in Great Britain in 1804 and ultimately spread over nearly every division of the army. The civil population soon became infected, the disease first showing itself in the brothels frequented by the soldiers, then generally through the country, chiefly where a number of people were housed together, as in asylums, workhouses, public institutions and schools.

This disease also appeared in Italy. It broke out among the Italian soldiers stationed at Elba and Leghorn shortly after the French troops from Egypt landed there in 1801.[12] From there it spread along the coast of the Tyrrhenian Sea to Genoa, also inland.

Hirschberg[13] also states that Trachoma was prevalent in Russia proper, the Baltic Provinces, and also in the Prussian provinces, before the French invasion, for he finds popular Trachoma remedies mentioned in the theses of that period at the Dorpat University. The Austrian Army remained free from

opthalmia throughout the whole of the campaign, notwithstanding that it repeatedly came into close touch with the French troops during the years 1799-1809. It was only after 1816 that three serious epidemics occurred.[14] These were due to the fact that the regiments affected had men who had gone through the Egyptian campaign.

The Russian Army escaped Trachoma during the Napoleonic wars. In 1818 it appeared in the garrison at Warsaw[15] and afterwards at Cronstadt and St Petersburg. During the Russo-Polish War of 1831 it acquired considerable proportions, and appears from that time to have remained endemic in the army. It was also present during the Crimean War, and during the Russo-Turkish War of 1877 it was the cause of four-fifths of the men being rendered blind.[16]

The Dutch and Belgian armies were also affected in 1815-25. It got worse after 1834, and 14,000 men were attacked. The chief Belgian Sanitary Officer considered that the main cause of the prevalence of the disease was the drafting of a large number of soldiers affected with granulations from the old Dutch army into the new Belgium one, also the wearing of unhealthy uniform. To remove the Trachoma 4,000 of these men were discharged from the army at once and so spread the disease through the country.[17]

According to Eble[18], the Swedish Army was infected from the Prussian Army in 1813.

Trachoma was unknown in the Danish Army until 1848,[19] when it was infected from the German troops.

We thus see that Trachoma found in the army a suitable nidus in which to develop, and under the influences of badly ventilated and filthy buildings, the hardships and insanitary conditions of warfare, the disease increased in virulence and resisted all attempts to keep within bounds.

After the European wars of liberation when the armies were reduced in size and more attention was given to hygienic matters, Trachoma gradually lost much of its virulence. It began to be more confined to certain areas, and appeared in the chronic form which is so common at the present time.

GEOGRAPHICAL DISTRIBUTION.

To assist in the elucidation of the aetiology of Trachoma, it is of advantage to study the geographical distribution. This was discussed for the first time at the Eighth International Congress for Hygiene and Demography at Budapest in 1897. Since then many accounts have been published from all parts of the world; a study of them gives an idea of the distribution of the disease.

In the east and north-east localities of the German Empire, Trachoma is endemic. As Trachoma has

probably been widespread and endemic from time immemorial in the western provinces of Russia, especially in Poland and the Russian Baltic Provinces, it is not surprising that it is continually being brought over the border into Prussia[20] along the trade routes.

According to Krichner[21] the reports from the Government districts of Prussia show that epidemic Trachoma prevails chiefly in East and West Prussia, in Posen, and in the border districts of Silesia. The disease prevails everywhere, chiefly among the lower classes, where dwellings are overcrowded and very dirty. The huts are low, with clay floors, small windows and beds in which several persons sleep together. A common washing basin and towel serve for all the inmates, in fact the most favourable conditions for preserving and spreading the disease.

As regards the number of persons infected in these provinces, Kuhnt[22], in 1897, estimated the total in East Prussia at 75,000, i.e. 3.7 per cent of the whole population. In West Prussia, Greeff[23] estimates the total number of Trachoma cases in 1898 at 47,250, i.e. 4.5 per cent of the population.

On account of the increased facilities for travelling, the disease has been carried to the Western districts, by tramps and labourers from Russia and the eastern parts of Prussia. In the same way the disease is imported into Germany by the Italians on the south, also from Bohemia, Belgium and the Netherlands.

There are no historical records to show how long Trachoma has been in Russia but judging from its present extent, it takes the first place among European countries affected with this disease. According to Reutlinger[23] the Crimean peninsula was always most affected. The disease was so prevalent that it went by the name "Krymsa", i.e. "the Crimean ophthalmia. Next to the Crimea, the western provinces, and military districts of St.Petersburg and the Caucasus are said to have been most affected. In 1879-80 Skrebitzky[24] estimated the number of blind in Russia at 400,000 and showed that one of the principal causes was Trachoma. The disease was also prevalent in the army and in 1892 Kamochi[25] estimated it at 66.9 per thousand of the effective force. Of these 71.6 per thousand belonged to the military district of Warsaw alone.

The chief cause of the prevalence of Trachoma in the army is stated by all authors to be the enrolling of recruits already infected, a practice which was allowed so long as the cornea was not seriously affected.

Among the civil population Trachoma is very prevalent and few districts of Russia are quite free from it.

The disease is also prevalent in Siberia. In 1910 Madame Putiata Kerschbaumer[26] investigated it in

the cities and town along the Trans-Siberian Railway. In eight months there were 8,342 cases of Trachoma treated, i.e. 384 per thousand of all eye patients. Of the total number, 1137 or 1241 per cent, were cases of incurable blindness, the causes being small-pox, 18.5 per cent, trachoma 15.6 per cent, and ophthalmia meonatorum 3.3 per cent. The worst victims were those who brought the disease with them from Russia, the spread being favoured by the bad sanitary conditions; it also rapidly extended among the native population.

Austria-Hungary, especially the eastern part, is also infested with Trachoma, though not to the same extent as Russia. Fuer[27] states that it was introduced into Hungary by the transference of the cavalry from Poland and Galicia in 1880.

Trachoma is also endemic in Constantinople, Roumania, Bulgaria. In Italy it is very common and increases in frequency towards the south, more particularly along the Ionian coast. It is also present in Sardinia and Sicily. Spain is also for the most part affected.[28] Switzerland is practically free from the disease except the districts bordering on Italy, from which country it is introduced. While living in the Canton de Vaud for three months in 1911 I did not see a single person suffering from the disease.

Trachoma is not very prevalent in France, only a few areas being specially affected, i.e. those bordering on the Gulf of Lyons. The statistics for

Paris[29] give 17 per thousand. There have been no wide-spread epidemics in the army since Napoleon's Egyptian Campaign[30] and at the present time it is very rare to find a case[31]; the strictest care being taken to reject all infected recruits.

The disease is very prevalent in Belgium, especially in the provinces of Antwerp and Flanders[32], though the Army at the present time shows relatively little disease, the incidence in 1900 being 0.67 per thousand[33].

Holland is less affected than Belgium.[44]

Denmark and Scandinavia, according to van Milligen[35], have very few cases, the number in Sweden and Norway amounting to 2.3 per thousand of population and to 2.5 in Denmark.

According to Th. German[36] of St. Petersburg, the disease is very prevalent in Palestine, especially during the hot season. At this time vegetation is scarce, water more so, and great clouds of dust rise on the slightest disturbance. In Syria he states that Trachoma is not so common as in Palestine. He attributes this to the fact that the land is richer and people live better, there is more vegetation and less dust during the dry season.

Falk[37] states that Arabia is a regular hotbed of Trachoma, its continuance being favoured by intense heat, want of water, dust, dirty habits of the people and visitation of pilgrims from all parts to Mecca.

India does not appear to be an exception to other Eastern countries. I have none of the reports to hand, but from those I have read, the disease appears to be wide-spread throughout the country. I have seen cases at Jhelum, in the extreme north of the Punjab, and also in all the stations I have been to in the south of India, i.e., Madras, Bangalore, Secunderabad, Bellary and Wellington.

In the East Indian Archipeglago, among the Malay population of the Sunda Islands, the disease is said to be prevalent.

In Java Kessler[38] found 34 per cent of the European children in Semarang with Trachoma, which he attributed to the "slendary", or carrying cloth, of the Java nurse. It serves to wipe the nose and eyes of both nurse and child and is rarely washed.

I was staying in Japan in the summer of 1908, and saw many cases of Trachoma at the eye clinic of the Imperial University Hospital of Tokyo. I also saw the disease at the following places:- Nikko, N., Yokohama, S., Atami, S., Yamada (Ise), Kobe, Kyto, Hiroshima, Miyajima, all on the main island and extending from east to west. I also saw it at Dogo, Tadotsu and Kompira on the south island of Shikoku. At these places there are hot springs and shrines, where people with diverse diseases come to be healed.

There is no doubt that there is plenty of Trachoma in Japan:- Mujakita[39] estimated that there were

750 per thousand cases of eye diseases.

As to China, the disease is equally wide-spread, especially among children and young adults. I was fortunate enough to have been stationed in Tientsin, North China, from 1908 to 1911, and have had many opportunities of observing the disease. In Tientsin City there is a temple with gods that are reputed to heal all kinds of diseases, including eruptive fevers, also to be able to confer maternity on those so desirous. Among these celebrated deities is one that has a great reputation as an ophthalmologist. I have spent many an hour at his shrine examining the cases that presented themselves. Of the eye cases I estimated there were about 30% suffering from Trachoma in all stages, but chiefly chronic. After offering incense and giving a few cash, the affected eye is made to touch the god, usually his hand, after this the patient rises and takes from a receptacle at the foot of the god, a small representation of an eye. It is made of baked clay, painted white with a dark pupil, shaped like the palpebral aperture and is about one inch in length. This is worn until the cure is complete.

There is every facility here for the spread and perpetuation of a disease like Trachoma.

Active cases of small-pox come in the same way to the temple, but confine their entreaties to another deity.

In September and October, 1909, I visited the following places along the valley of the Yang-tze-Kiang:- Kwei-tcheou,in the province of Szechuan, about 1000 miles from the sea, Koue-tcheou, Ichang, Hanyang, Han-Kau, in the province of Hu Peh; Yochow, Tchang-cha, in Hu Nan; Kiu Kiang, in the province of Kiang-si; Ta Tung and Tung Kwan Shan, in Anhwei; Nan King, Suchow and Shanghai, in Kiangsu. In all these places, there is acute and chronic Trachoma, at every age and in all stages. The climate along the valley of the Yangtse is moist and warm, except for some months in winter, when the temperature may fall to 40° F., depending on the prevailing winds. Conditions are very favourable for spreading the disease, especially in the large cities.

In November and December 1910 I went on a walking tour in the mountainous province of Shansi. I visited Tai Yuen Fu, the capital of the province, and the following places: Chin-tzu-Chen, Chao-Cheng, Wen Shiu, Fen-Chou Fu, which are on the plains. I then entered the mountains and came to Wu ling Dee, Wu-cheng, and several places not marked on any map. Some of them have never been visited by foreigners before. I covered over 200 miles in these parts and reached an elevation of 8000 feet. In all the towns on the plains Trachoma was prevalent in youths and adults. I was unable to look at any children, as the Chinese have an idea that foreigners cut out their eyes to make medicine out of them. So they are all shut up

in the house on the approach of a foreigner. In the mountains I saw only a few cases in the larger villages; on inquiry I was told that a good many of the inhabitants came at one time from the plains and so brought the disease with them. In the hills the people live in cave dwellings, these are excavations made in the side of a hill, with a door and paper window to keep out the weather. They are overcrowded, smoky, and very dirty, and have all the conditions necessary for the preservance of the disease.

The province of Shansi is composed chiefly of Loes, a clay which when dry crumbles to a powder finer than flour. There is no doubt that it is a great source of irritation to the eyes.

The disease is also present in the south of China. Hirschberg[40] estimated it at 700 per thousand in Canton.

In Australia,[41] Trachoma is apparently introduced by immigrants.

Egypt from time immemorial has been known to be infested with Trachoma. Hirschberg[42] visited Egypt in 1889 and found that Trachoma was constantly present among the Egyptians, and also prevalent in the schools. In 1894 Fuchs[43] stated that probably not a single person among the poorer classes in Lower Egypt was free from this disease. In 1898 Leopold Müller[44] visited Egypt and found that Trachoma was wide-spread, that all adult Arabs have cicatrices and that the disease usually occurred before the third year of life. According to

Falk[45] the disease is also spread over the whole North coast of Africa and it is common in the regions around Senegal and the Niger.

In 1897, H. Lewkowitsch gave an account of his fourteen years experience in Cape Colony and the Transvaal. Among the Boers nearly half his eye patients had Trachoma. He also found the disease common at a height of 6,000 ft. and frequently among the Kaffirs and Hottentots.

Trachoma is also very prevalent in most parts of America. Edward Davis[46] proved that its introduction into the United States is due to immigrants. In Montreal, Foucher[47] found that Trachoma amounted to 36 per thousand.

There is very little Trachoma in the United States Army. The Surgeon-General's report[48] gives it at 0.34 per 1,000 in 1895; and 0.08 in 1897. Swan Burnett[49] examined statistics from thirteen different parts of the United States and affirms that the negroes are practically free from the disease, notwithstanding they live in surroundings calculated to cause it to flourish.

Trachoma is also very prevalent in South America, especially in Brazil, according to Falk it is said to have been introduced by slaves from West Africa.

The Argentine Republic is also similarly infected. O.Wernicke[50] states that the disease is very common in Buenos Ayres and believes that it was introduced from Spain.

In Great Britain, the disease has been very considerably less, since the Egyptian campaign against Buonaparte; it is still found in England, Scotland and Ireland. According to Sydney Stephenson, in 1895, the number of Trachoma cases in England averaged 6, in Scotland 9, and in Ireland 26.4 per thousand of all eye patients. As to the army, the disease seldom occurs now-a-days.

4. ETIOLOGY.

According to the records of Plato and Galen[51], more than 2,000 years ago, the Greeks were familiar with the contagious nature of Trachoma, and believed that it might be contracted by looking at a person suffering from the disease. This theory was also held by the Arabian physicians. In the early part of last century the physicians were divided in opinion as to whether Trachoma was contagious or not. There were thus two schools, and so those that believed that the disease was non-contagious assisted greatly in its spread. The French authors also believed it to be non-contagious. In Germany opinion was divided. Baltz[52] denied that it came from Egypt as had been so strongly advocated by the English, he also did not believe it to be contagious, but favoured the theory of its spontaneous miasmic origin under the unfavour-

able conditions of life in the time of war.

On the other hand, Rust maintained that the chief factor in the production of Trachoma was a virus which was continually being reproduced by the disease itself. Von Walther, Graefe, Werneck,and others, concurred with him in this. C. F. Graefe[53], who entertained similar views to Rust, sums up the various views that were held at that time as follows:- "Many held the cause of the disease to be the extremely fine prickles of the cactus plant disseminated through the air, others those of Fillaria papillosa, many fine nitrous or chalky particles entering the eyes, others the atmosphere charged with muriatic fumes, metastasis from some catarrhal, typhoid, dermatitic, or scrofulous complaint, infection with gonorrhoea or syphilis, and others again, an infection sui generis."

Graefe also believed in some specific cause, and also a number of "indirect causes." These were: too bright light, excess of blood to the head favoured by the unhealthy character of the soldiers uniforms, especially the heavy helmets, close-fitting collars and tight belts, the heavy knapsacks, fatiguing marches and hardships of all kinds, indulgence in alcohol, dust, close-cropped hair and previous blennorrhoea.

As occasional causes Graefe also mentions "the exhalations of people crowded together", especially in over-crowded, ill-kept infirmaries, foundling hospitals, and workhouses, as well as in all close, damp,

and dirty dwellings, muriatic vapours, especially along warm sea-coasts; also diminution of secretion "in the mucous tracts of the lower parts of the body," in the intestine, bladder, and urethra. Sudden chills, frequent bivouacs, stations in rainy districts on the sea-coasts, near lakes, marshes, and large rivers, the autumn season with rainy, changeable weather, the too rapid cicatrisation of purulent wounds, and the too-quick healing of chronic ulcers, are all mentioned.

In the early part of the last century, the Belgians were of two opinions as to the spread of Trachoma, i.e., those who looked on it as a contagious disease, and those who did not. The anti-contagionists attributed the disease in the army to the glare of light reflected from the white tunics of the infantry, and the continuous compression of their necks by their cravats, yet a complete change of uniform had no beneficial effect on the condition.

In the great Belgian epidemic of Trachoma in 1841, Deconde'[54] came to the following conclusions as to its causation:- (1) its endemic origin, (2) gonorrhoea, (3) infection of adults with the purulent discharge of new-born infants, (4) its introduction from Italy, (5) especially the infection of the Belgian army by English and Prussian troops.

At the Ophthalmological Congress at Brussels[55] in 1857, air was still supposed to be the most common

medium of transmission for the contagion, and it was also pointed out that the virus might be conveyed by utensils which had been contaminated in infected places. It was maintained by A. von Graefe in 1864 and F. von Arlt in 1881, that the disease was transmitted by the air.[56] At the tenth International Medical Congress at Berlin[57], Sulzer, of Winterthur, who had practised for seven years in Java, stated that air infection was the rule in special Trachoma countries, particularly in Arabia and the Sunda Islands. In Java only a few mild cases occurred during the rainy season, although the people spent the night and day in their small houses, while the cases became numerous and severe as soon as the dry weather set in, when great quantities of dust were always in the air. In almost all the cases it could be proved that these patients had been exposed to the dust for a long time before their infection. It was proved several times in the Dutch colonial army that dust was the actual medium of contagion, and that it did not merely aggravate a previously existing condition.

The great majority of German authors deny infection by air or dust. Schweigger[58], in 1885, wrote that, "the causes of Trachoma must be sought chiefly in bad sanitary conditions. Badly ventilated, overcrowded rooms in houses, barracks, schools, etc., may not only produce Trachoma in a previously healthy conjunctiva, but give a trachomatous character to any chronic conjunctivitis."

Formerly the Army took an important part in the spread of Trachoma among the civil population. It usually happened that some recruits suffering from the disease in the chronic stages were passed into a regiment. As the eye usually showed no discharge for a variable period, it remained unnoticed, until a discharge was started by exposure to wind, dust or tobacco smoke, etc. Now, as the soldiers lived in overcrowded, badly-ventilated, and ill-constructed barrack rooms, and also used common washing-basins and towels, the disease was bound to spread with great rapidity, and in a very short time the whole regiment would become infected.

In war time, hygienic matters were much worse than in peace, with a consequent increase in the disease. Hospital treatment was not satisfactory, and as a result, the majority of soldiers were discharged half cured, to bring the disease into their homes, and eventually to the civil community in their districts, who in their turn supplied the army with fresh supply of trachomatous recruits.

At the International Congress at Moscow in 1897, Lawrentjeu,[59] who was oculist to Moscow military district of fourteen departments, stated that the disease was conveyed from the army into areas which were previously free. He remarked: "There are still some departments in the district which are quite free from the disease; some time ago, however, this applied to

the whole of Central Russia. Since the larger number of the recruits in the Moscow military district have been drafted to the western frontier, to Poland, they have returned with Trachoma, and have infected areas which were previously unaffected, while the troops in the Moscow district draw their recruits from the eastern Russian provinces, and they in their turn introduce most of the Trachoma into our regiments. Thus, by the infection of unaffected areas by the troops on the one hand, and the introduction of Trachoma by the recruits into the army on the other, a vicious circle is formed, for which it is very difficult to find a cure." The discharged trachomatous soldiers as a rule return to their homes, and so start the disease, if it had not been already there. This occurs chiefly among the poorer classes with small dwellings.

In the great majority of cases the infection is conveyed by the use of the same towel, and by several of the family sleeping in one bed. After the family, the next great seat of infection is all those places in which large numbers of people are crowded together in a comparatively small space, and who often come into personal contact with one another, or make use of common washing utensils, especially towels. Such places would include boarding-schools, seminaries, penitentiaries, workhouses, orphan asylums, etc.

There is no doubt that want of cleanliness is very important, and a single case occurring is quite sufficient to spread it over the whole of that institution. It has not yet been proved that contagion can adhere to the walls of a room which has been occupied by a Trachoma patient. But Vossius[59] states that this is the only explanation which can be given in cases where every new arrival contracts the disease, while no fresh attacks are seen when the rooms have been carefully cleaned out and repainted.

Förster[60] also believes that the disease is spread by infected quarters, and considers this a more serious and frequent source of infection than that from person to person. Residential pauper and convent schools play an important part in the spread and perpetuation of Trachoma, especially when common rooms and washing utensils are used. Those affected in these institutions are seldom properly cured, unless specially looked after, they grow up and infect their own offspring. Age does not seem to confer immunity or favour predisposition as the disease is met with at all ages, being dependent on the chance of infection. Neither does sex seem to have any special influence, except that in some countries women are more confined to a dirty and overcrowded house, and so exposed to these injurious

influences. Clinical experience seems to show that there is a sort of individual predisposition and immunity to the disease, for it often happens that certain members of families remain free altogether, or for many years, although they live on great terms of intimacy with those that are affected.

Immunity has been attributed to the chemical composition or bactericidal properties of the lacrymal secretion.[61] Matkovič[62] states that self-protection is derived from the alkalinity of the secretion, which is greatest in smooth, healthy conjunctiva, and lessened in the loose, rough, folded or discharging conjunctiva, which has corners for the causative agent to lurk in.

Most authorities are of opinion that individual predisposition is dependent upon general constitutional conditions, bad nutrition, anaemia, and tuberculosis, also that all chronic irritative conditions render the eye more susceptible to Trachoma, and that these are aggravated by external sources of irritation, such as dust, smoke, heat, moisture, wind, want of sleep, overcrowding and bad ventilation. The result of these irritants is to cause itching of the eyes, which the patient involuntarily rubs, and so infects his fingers and anyone else he subsequently touches.

From the account of the geographical distribution, the disease appears to be widespread over the whole world. In some countries it occurs only in sporadic cases, while in others it is endemic and pandemic. It seems to be commoner along rivers and sea coasts, also in tropical and subtropical climates, where dust, high temperatures and moisture are the chief characteristics. Dust plays a considerable part in the spread of the disease as it gets into the eyes, causes irritation and consequent increase of the discharge, and with it the power of infection. The excessive discharge also attracts flies which may readily carry the infection on their feet, as they have been proved to be carriers of other diseases. High temperature cannot be said to have much influence on the spread of Trachoma, as the disease is also found in cold climates such as Canada, Finland and Siberia. In the same way altitude does not appear to have any restraining influence on the disease, except that at these elevations there are fewer people, who are more difficult of access and consequent diminished intercourse. Once the disease has started in a mountainous district, it can continue. I have seen it in Shansi, North China, at an elevation of 6000 feet.

As to race, Burnet of Washington in 1876 stated that the immunity of the Negroes in the United States

was simply due to the influence of race. In fifteen years he only saw six suspicious cases of Trachoma among 10,000 negroes' etes, notwithstanding the fact that they live mostly crowded together in unhealthy regions and are very subject to tuberculosis which also affects their eyes.

Yarr[63] also believes in racial predisposition. He distinguishes three grades of susceptibility, the susceptible, the relatively immune, and the absolutely immune races. The first class includes the Chinese and Japanese, among whom Trachoma forms 75 to 98 per cent of all eye diseases, and of white races, the Jews, Poles, Italians and Irish. The full bred negroes of the United States, Senegambia, Guinea, and West Africa, as well as the natives of Ceylon, are relatively immune. The absolutely immune include the Canadian Indians and Eskimos, and the Cris and Santeaux of Manitoba, who live in close proximity to the very susceptible Russian Mennonites. The Red Indians of the United States, on the other hand, belong to another race, and are not immune.

Yarr also states that immune races may become susceptible in a hot, dry climate,and susceptible people may become immune when the climate is cold and damp. All other influences, such as poverty, dirt, bad food are of less significance than race, while climatic and meteorological influences are only of secondary importance.

In Cuba the susceptibility of negroes, whites and Mongols is as 1:4:7. In Java the Chinese are said to suffer more than the Malays.

This theory of racial immunity has been denied by many observers and de Gouvea in 1896 at the French Ophthalmological Society pointed out that the immunity which is claimed for negroes did not exist, because in South America, where the negroes are of the same race as those in North America, the disease is very prevalent among them. The negroes of North America are less exposed to infection, because they are debarred from all intercourse with the white population. In Brazil, Turkey, Egypt and South Africa they are more exposed to the disease and consequently suffer more.

The same may be said of the Jews, that they do not exhibit any special predisposition to the disease, for although it is very common among the ignorant and dirty Polish Jews, it is rare among the more cultured and civilised Jews of Hungary.

I can find no conclusive evidence to prove that race is of any importance as an aetiological factor in this disease.

In the early part of last century inoculations were tried. Piringer[64] inoculated the left eye of a blind beggar with mucus from a case of Egyptian ophthalmia; three minutes later he carefully washed out the eye and applied cold compresses for ten hours, with

a negative result. In 1823, during the epidemic at Klagenfurt, Werneck inoculated two attendants who had remained immune for a long time, though they were nursing the worst cases of eye disease. He excised the granulations of a patient who had had them for 2½ years, and rubbed them gently over the attendant's conjunctiva several times. Both cases the most pronounced and typical attacks of the disease after nine to fourteen days.[65] Addario[66] and Greef also performed inoculation experiments, they transferred trachomatous excised follicles into the scarified conjunctiva of blind persons. In three or four days hyperaemia began, and after about eight days, the infiltration.

Hess and Römer[67] rubbed fresh trachomatous material into the conjunctiva of apes, which produced a dense formation of follicles. This inoculated infection could be transferred to a second ape for six to seven weeks. When the affection spread to the other eye no follicles formed there, but microscopically a few granules were to be seen. They also ground up some trachomatous material and passed it through a Berkefeld filter; the filtrate produced no reaction, while the unfiltered material acted vigorously on direct inoculation. When the ground-up material was heated to 58° to 63° C. no infection resulted.

Bajardi[68] reported that he inoculated the Marcacus and Cercopithecus with successful results. He

either planted a piece of trachomatous tissue into a pouch made in the ape's conjunctiva, or he injected subconjunctivally an emulsion of the trachomatous material. The inflammatory symptoms subsided and from the second week onwards a granular inflammation occurred, lasting a ling time, and spreading to the plica semilunaris and conjunctiva bulbi. He did not observe cicatrization.

In cases of unilateral Trachoma, Germain[69] inoculated the healthy eye, by rubbing in or subcutaneous injection of material from the diseased eye. He never obtained a successful result. There appeared to be a unilateral immunity. He also inoculated his own conjunctiva without any result.

Bäck[70] also reports that he has often inoculated his own conjunctiva with secretion from Trachoma, with negative result.

E. Herford[71] successfully inoculated the eye of a dog-faced baboon from the discharge of an untreated case of Trachoma. He also failed in similar attempts upon another animal of the same species, with the secretion from the same case of Trachoma,and also from another case. On the second day after the successful inoculation the eye became irritable with some secretion. There followed a transient follicular development, which subsided spontaneously; there was nothing approaching the picture of human trachoma, but characteristic trachoma bodies were found regularly

in the secretion from the 14th to the 35th day after the inoculation.

Numerous investigators have been at work for the last twenty-five years endeavouring to ascertain beyond dispute the exact nature of the infectious agent.

Several kinds of Gram positive diplococci morphologically resembling the Gonococcus have been described by various observers:- Sattler in 1881, von Michel in 1885, Raehlmann in 1885, Ponat in 1886, Désormes in 1886, Kucharski in 1887, Waggeewski in 1887, Petresco in 1888, Schmidt, Staderne in 1888, and others.[72]

Sattler[73] is is stated to have found his diplococcus in the conjunctival discharge and in the follicles, and that it was also isolated in pure culture. He is said to have inoculated a healthy human conjunctiva with pure culture and to have produced trachoma. He also rubbed in micrococci from the third generation of a culture, into the conjunctival sac of a man. "In five days the first vesicular granules of Trachoma appeared, and ran a very mild course." Sattler was of opinion that his organism was probably derived from Neisser's gonococcus.

When Robert Koch[74] was travelling in Egypt and India in 1883 he made several investigations the result of which seemed at first to confirm the findings of Sattler. He examined the conjunctival discharge of

fifty cases of Trachoma and found in them two different kinds of bacteria which produced two different diseases. One of these was caused by an organism similar to the gonoccus,and the other by small bacilli, similar to those of mouse septicaemia, which are known as Koch-Weeks baccilli.

Hirschberg and Krause[75] in 1881 found bacilli in the discharge of people suffering from acute Trachoma, while they were absent in chronic Trachoma.

In 1891 Shongolowicz[76] found in 38 trachomatous patients a bacillus 1 to 2 μ long, and 0.3 to 0.5 broad, which stained with Gram's method and produced the disease in animals on inoculation with pure cultures. This organism was probably the Bacillus Xerosis, and proved to be incapable of producing Trachoma by itself.

In 1897 Burchardt[77] found in the epithelium - magnified 500 diameters - numbers of well-defined, oval, non-nucleated, apparently solid bodies, which he called coccidia. The results of inoculation experiments were negative, and he sunsequently found the bodies in other conjunctival diseases. These were the goblet cells of the conjunctiva.

In the same year Czaplewskt[78] isolated from the contents of Trachoma follicles peculiar large cellular amoeboid bodies, of very variable shape. They were 10 to 30 μ in size.

In 1897 Elze[79] found both in the discharge and the follicles of a case of Trachoma of five weeks'

duration, bodies like plasmodia, which in hanging drops of salt solution showed movement. He classed them amongst the Monads, but are now known as the cell detritus.

In 1897 L.Muller[80] examined 63 cases of Trachoma; in 23 of these he found an organism morphologically and biologically similar to the Bacillus Influenzae (Pfeiffer) and considered by some authorities to be identical.

In 1895 Krudener[81] described peculiar cell inclusions in the large cells of the trachoma follicles; he called these "Körperchenzellen" or "Wimmelzellen" - "granule cells" or "swarming cells," on account of their molecular movements. It is very doubtful whether they have a parasitic nature, as Leber[82] found the same appearance in the follicles of the normal conjunctiva.

In 1905 E. Raehlmann[83] found the contents of the trachoma cases he examined to be composed of numerous morsels of protoplasm and bacteria, which exhibited vital movements on the warm stage. This organism appeared in five forms: (1) a biscuit-shaped body, (2) the same arranged in chains of bacteria, (3) as diplobacilli, (4) as small rods, (5) punctate or spherical particles. He is of opinion that all these are different stages in the growth of the same micro-organism, and they all exhibit rapid movements.

Besides the vital movements of the bacteria innumerable little particles of protoplasm are seen with similar movements.

In 1907 Halberstaedter and Prawoczek[84] reported that they had examined smears from Trachoma,and by staining by means of the Giemsa stain they found near the nucleus of the epithelial cells round or oval, dark-blue or violet, non-homogeneous masses. Within these bodies with good staining, they found very sharply defined small bodies, which stained a red colour.

In many of the epithelial cells these granules coalesce and form bodies, which cover the nucleus like a cap. Prawoczek stated they were certainly parasitic and from the appearance of a clear mantle covering the nucleus called them Chlamydozoa. They investigated the results of Trachoma in orang-outangs in Batavia, and came to the conclusion that the infection lay in the epithelial cells and not in the follicle.

G. Lodato (Sienna),in 1908, states that by the use of Mann's method of staining he has succeeded in demonstrating certain appearances not hitherto recorded. The bodies are to be found in the adenoid tissue and also inside trachoma follicles in the conjunctiva from a case of this disease. They appear like rounded corpuscles, tinted purplish red, without any visible structure, and vary in size from the minu-

test granules up to that of an erythrocyte. The larger ones are very rare, the smaller and medium sized being more frequent. These are now known to be products of the paranucleus and have been found in many other conditions.

In March 1909 E. Herford[85] (Cassel) reported that he had followed Prowwazek's method in examination of conjunctival secretions. The smear preparation, after fixation in absolute alcohol, is stained 6 hours in the following mixture:- 12 parts of 1-2000 Eosin (freshly prepared), 3 parts of 1-1000 Azar I, 3 parts of 0.8 - 1000 Azur II. It is then washed in water, dried, and mounted in cedar oil. Twenty cases of Trachoma were investigated in Königsberg and a few more in Berlin. Over a hundred control examinations of secretion from non-trachomatous conjunctivitis and from the normal conjunctiva were examined with negative results. He successfully inoculated the eye of a dog-faced baboon, with the discharge from an untreated case of Trachoma. He failed with a similar attempt upon another animal of the same species, from the same case of Trachoma, and also from another case. On the second day after the successful inoculation, the eye became irritable, with some secretion. There followed a scanty transient follicular development, which subsided spontaneously; there was nothing approaching the appearance of human Trachoma, but characteristic trachoma bodies were found regularly

in the secretion from the 14th to the 35th day after the inoculation.

He describes the first appearance in an infected epithelial cell, stained by the above method, as a dark blue irregular mass, of the same tint as that of the nucleolus and sharply differentiated from the pale blue protoplasm. The dark blue substance lies typically to the nucleus, but may be distributed also irregularly in the protoplasm. Fine granules appear and rapidly multiply in these masses and at their edges, coloured more of a purple tint. The blue substance gradually breaks up and disappears from the centre of the mass outwards. So there results a group of dark granules lying in a space less deeply stained than the surrounding cell substance. The granules multiply more and more, till they occupy nearly the whole cell and distend it. Ruptured cells are also found, with the granules partly scattered in the surrounding secretion.

In 1909 Stargardt[86] (Strassburg) reported that he had examined by Giemsa's stain, the epithelium of 140 cases of different conjunctival affections. He found the protoplasm of the epithelial cells of the normal conjunctiva showed a fine thread work or honey-comb appearance of a light blue colour. In conjunctivitis there was always a thickening of this blue stained substance. Sometimes this network stained red instead of blue. He also found in all cases small

diplo-bodies, the smallest being seen only with a magnification of 1000. In Trachoma cases he found semilunar blue-stained bodies lying close to the nucleus of the epithelial cells. These bodies were sometimes ill-defined and then appeared as a blue shading, partly surrounding the nucleus. He also found small inclusions stained red. He rarely found the minute red bodies which von Prowazak considered a likely cause of trachoma. He is convinced that these semiluna bodies are only found in early Trochoma.

In 1909 Drs. A. Lebner and M. Hartmann reported on 56 cases of Trachoma,[87] principally early cases in children and mostly untreated. They found characteristic trachoma bodies even in the later stages of the affection, in cases where the whole conjunctiva had not undergone cicatricial chamges.

Dr. di Santo in 1909 reported that he had succeeded[87] in demonstrating the trachoma bodies in sections of affected conjunctiva. The tissues were fixed in absolute alchohol and embedded in paraffin.

In 1909 Prof. Dr. Hans Herzog (Berlin) noticed in smears from Gonorrhoeal[88] conjunctivitis stained by Giemsa's method many gonococci in the epithelial cells, closely grouped near the nuclei of the cells, and embedded in plastin masses, as occurs with trachoma granules. He assumed there was a close relationship between the gonococcus and the trachoma bodies, and claims to have demonstrated in cultures of the

gonococcus an involution form which he terms the micro-gonococcus, which stains with Giemsa's stain like the trachoma body. He is of opinion that the trachoma body is a special modification and derived from Weisser's gonococcus. In support f of this he mentions a case of acute conjunctivitis showing at first typical gonococci in great numbers. Afrter six days enerjetic treatment gonococci were found only in the leucocytes and not at all in the epithelial cells. After another six days the gonococci had disappeared altogether, but numerous cell-inclusions were now found for the first time, exactly like typical trachoma bodies. Four weeks later the microscopical findings were negative, and the conjunctiva almost normal.

In 1910, H. Fritsch, A. Hofstatter, K. Linder, made successful inoculations upon the conjuncitiva of baboons. The material used was taken from infants eyes affected with gonococcus free conjunctivitis, second, from the vagina of the mother of one of these infants, 3rd, from the discharge of a gonococcus free urethritis. The discharge from each of these three sources contained the same typical cell-inclosures, as well as free "initial

forms" indistinguishable from those found in trachoma. By the inoculations a characteristic conjunctivitis was set up in the baboon's eyes, which could not be transferred from one animal to a another. Two forms of inflammation were observed. The first type resulted from infection with secretion from the so-called "inclusion blenorrhoea" of infants. This was a purulent type with acute onset, an incubation period of 3 to 5 days, and a relatively short duration of three weeks, ending in a free formation of lymph follicles. The second type usually has a longer incubation period of from 7 to 11 days. It is more chronic and lasts several months, it also produces larger granulation than the former. It was caused by inoculating material directly from the adult genital tract. The cell-inclusions are not as a rule found in the infected conjunctiva until after the height of the attack.

While in Tientsin, North China, from 1908 to 1911 out of the number of cases of Trachoma which came under my observation from time to time, I examined microscopically forty-eight, the result of which is recorded in Table 5. I had no means at my disposal for making bacteriological examinations. In January 1912 I was granted six months study leave, and restarted work on this disease with a view to ascertain:-

1st: If possible, the cause of Trachoma.

2nd: The constancy of the Trachoma body in the epithelial cells of the conjunctiva, in the early stages of the disease.

3rd: The constancy of the signet-ring-shaped bodies which are found free in the conjunctival discharge.

4th: The constancy of free granules, staining pink with Giemsa's stain.

5th: The presence of these appearances in the normal as well as in other conjunctival affections, including ophthalmia Neonatorum.

I was working at the Royal London Ophthalmic Hospital, under Mr E. Treacher Collins, who very kindly allowed me to examine his cases of Trachoma. They were nearly all children attending the London Poor Law Schools and who were suffering from "sore eyes" and had been referred by the Medical Officer of the school to him to decide if they should be admitted to the Ophthalmia schools of the Metropolitan Asylums Board. Those that were diagnosed Trachoma, I took to the Laboratory for further examination. This department is in charge of Dr. S. H. Browning, who very kindly supervised the work and verified my findings. He also placed at my disposal any other cases sent for bacteriological examination.

The following observations were made and recorded

in a tabular form for simplicity and purposes of comparison:-

Number of Case,

Date,

Name,

Sex,

Age,

Occupation,

History of Condition

Supposed Place of Infection.

Duration.

Eyes affected,

Previous Treatment,

Lachrymation,

Photophobia,

Pain

Cornea (Pannus, Leucoma, Ulceration)

Scleral Injection,

Iritis,

Xerophthalmos,

Lids (Drooping, Thickening, Entropion, Ectropion, Trichiasis, Subcutaneous vessels dilated on upper lids.

- Hypertrophy
  - Tarsal
    - Upper — Right
    - Lower — Left
  - Retrotarsal
    - Upper — Right
    - Lower — Left
- Trachoma Follicles
  - Situation.
    - Tarsal
      - Upper — Right
      - Lower — Left
    - Retrotarsal
      - Upper — Right
      - Lower — Left
  - Character.
    - Elementary, i.e. the smallest visible with a - 13 D stereoscopic magnifier.
    - Large, i.e. Easily visible to naked eye.
    - Mixed.
- Cicatrices .....
  - Upper — Right
  - Lower — Left.

Discharge
- Presence or absence and character.
- Bacteriological,
- Microscopical findings.

I have not made a summary of the constancy or otherwise of the various conditions of the lids that were examined as it would not be of any assistance in the present paper.

I may add that it was very difficult to obtain accurate histories, to trace the place or source of infection, or even to know of the presence of the

disease in other members of the family, as the patients were nearly all children, who were very uncertain about any of these points.

In the attached list of cases the following contractions have been used:-

Present	=	+
Absent	=	o
Right	=	R
Left	=	L
Upper	=	U
Lower	=	Lr.
Tarsal	=	T
Retrotarsal		R
Muco Purulent	=	M.P.

BACTERIOLOGICAL METHODS.

1. A culture was taken by stroking the conjunctive of the upper fornix with a platinum loop, and inoculating a human blood agar slope made as follows:- Agar 2.% giving + 10 Eyres scale. This was melted and cooled to 46° C. 3 or 4 drops of citrated human blood added, then shaken without causing frothing and allowed to set as a slope.

2. Human blood agar slopes were also inoculated with Trachoma Follicules, which had been well washed in warm saline and broken up. This was tried in ten cases.

3. In ten cases ordinary tap water was used as a culture medium, for the discharge from Trachoma cases.

4. Human blood agar slopes were also inoculated with the discharge from ten cases of ophthalmia neonatorum.

5. These were all inoculated at 37° C. for 24 hours and examined, subcultures were made when necessary.

BACTERIOLOGICAL REPORT ON 27 CASES OF TRACHOMA.

TABLE I.

Serial No. of Case	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	32
Staphylococcus Albus	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
ditto. Aureus	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
ditto. Citreus	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
B. Xerosis	+	o	+	o	+	o	+	o	+	o	+	o	+	o	+	o	+	o	+	o	+	o	+	o	+	o	+
B. Koch-Weeks	o	o	o	+	o	+	o	+	o	+	o	+	o	+	o	+	o	+	o	+	o	+	o	+	o	+	o
B. Morax-Axenfeld	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
M. Catarrhalis	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
B. Subtilis	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
Pneumococcus	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
Numerous very small granules. Gram. Neg.	o	o	o	o	o	+	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
Signet-Ring. Bodies as found in Smears	o	o	o	o	o	o	+	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
Signet-Ring. Bodies Free: Staining Blue with Giemsa.	o	o	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Free: Very fine granules. Pink with Giemsa	o	o	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Trachoma Bodies in Epithelial Cells.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

27	16	2	1	14	8	6	4	1	0	2	2	23	25	25
					CULTURE							SMEARS		

SUMMARY OF BACTERIOLOGICAL REPORT.

TABLE II.

No. of cases examined	Organisms found	No. of times present
27	Staphylococcus Albus	16
"	" Aureus	2
"	" Citreus	1
"	Bacillus Xerosis	14
"	" Koch-Weeks	8
"	" Morax Axenfeld	6
"	Micrococcus Catarrhalis	4
"	Bacillus Subtilis	1
"	Pneumococcus	0
"	Numerous very small Granules) Gram Negative)	2
"	Signet-Ring Bodies as found) in Smears)	2

TABLE III.

No. of cases examined	Human Blood Agar Slopes inoculated with washed Trachoma Follicles	No. of times found
10	Staphylococcus Albus	3
	" Aureus	2
	Sterile	5

BACTERIOLOGICAL REPORT Continued

TABLE IV.

No. of cases examined	Ordinary Tap water inoculated with discharge from Trachomatous eyes	Result and No.of times found
10	Staphylococcus Albus	3

From the Bacteriological Reports it will be observed:-

I. That none of the organisms mentioned were constantly present.

II. That the Staphylococcus Albus and Bacillus Xerosis occurred with greatest frequency. These organisms have been proved many times to be almost regularly present in the normal conjunctiva, and so cannot be considered as the causative agent of Trachoma.

III, That no importance can be attached to the presence of the Bacilli of Koch-Weeks and Morax-Axenfeld, as they are known to be constantly found in other conjunctival diseases altogether different from Trachoma.

IV. That no importance can be attached to any one of the organisms found, unless that its presence produces a mixed infection, which may aggravate the existing disease.

V. That the causative agent of Trachoma is not dependent on any of these organisms, as none of them has been constantly found present.

VI. From Table No. II, it will be noticed that only the common Staphylococcus was found on the tubes inoculated with the expressed trachoma follicles.

VII. From Table No. III, the same result was obtained thus showing that whatever the causative agent of Trachoma be, if it grows in tap water, I failed to detect it or subculture it on human blood agar, or if it can grow, ordinary methods of staining fail to make it noticeable.

I was unable to perform any inoculation experiments on men or animals, and so cannot state positively, that the disease is not conveyed by water.

IX. In cases No. 19 and 20 of the Bacteriological Report two cases of Signet Ring Bodies were found on the Culture, and that in cases 26 and 27 that fine granules were found.

I concluded that these bodies were some of the actual ones that had been in the secretion when the tube was inoculated, as there was no unusual growth, and they could not be subcultured.

MICROSCOPICAL EXAMINATION

1. Scrapings were taken from the conjunctiva of the tarsal and retrotarsal folds of the upper eyelids, by means of a platino-iridium knife, spread on glass slides and allowed to dry in the air. They were then fixed in Methyl Alcohol for five minutes,

and put into a 3% solution of Giemsa's stain for twenty four hours and examined with a $\frac{1}{12}$ oil immersion lens and No. 4 ocular.

2. Thirteen slides were also stained with Löfflers Methylene Blue, washed with water and examined in the same way.

3. The following were also examined:

(a) Conjunctivitis (Koch Weeks) clinically:- 20 cases.

(b) Conjunctivitis (Morax Axenfeld) clinically:- 20 cases.

(c) Normal Conjunctiva, 10 cases.

The following appearances were observed in the specimens stained with Giemsa.

I. Epithelial Cells:- The outline of the cell was distinct, the protoplasm of a faint blue colour, the nucleus coarsely granular and of a reddish-violet colour, occasionally blue, see Plate IV, Fig. 22, the nucleolus of a blue colour. In the protoplasm of some of the epithelial cells from the Trachoma cases, bodies composed of various sized granules were visible, some of which were approximately 0.25 μ in diameter, but mostly smaller. The granules sometimes occurred in pairs, see Plate I, fig. 1, but as a rule this form of grouping was not often observed.

The granules were arranged in clumps, which assumed such diverse number of shapes, that it would be impossible to describe them in an accurate and satisfactory manner. The commonest outlines were round, elliptical and semi-lunar. I have painted most of them on the accompanying plates I, II, III, IV, and have attempted to show the actual appearances that I observed and recorded at the time of examination. Although these are not made to any special scale, yet the relative proportions of the various structures have been rendered as accurately as possible.

As a rule the granules all stain a dark blue and stand out distinctly from the rest of the protoplasm, and separate from the nucleus of the cell. Sometimes the mass of granules stains red, see Plate I figs. 4, 5 & 6, and at other times, very rarely, a few red granules may be found in the middle of the blue clump, Plate I, fig. 6 and Plate IV, fig. 21. Sometimes groups staining red and blue may be observed separately in the same epithelial cell, Plate I, fig. 2, Plate II, fig. 8. These granular bodies do not seem to occupy any constant position in relation to the nucleus, but seem to be influenced by the spreading and fixing of the specimen. In some cases they are found at the extreme edge of the cell, Plate II, fig. 7, in others close up to the nucleus,

they usually occupy a place midway between these positions. These granular bodies have been called Trachoma Bodies, Coccoid Bodies, Cell Inclusions and Chlamydozoa. I shall use the first name in any further reference to them in this Thesis.

The number of these Trachoma Bodies in the cell is not constant, one, two and three are the commonest arrangement. The frequency with which the cells are affected varies greatly in different cases, sometimes 25%, but 4% would be a fair average.

II. In 43 of the specimens stained with Giemsa, in which Trachoma Bodies were found, there were also visible a great number of extra-cellular bodies which stained a faint blue. They varied in size from 1 to 5 μ in diameter. In appearance they were something like small signet rings, composed of fine granules. They did not always assume the ring shape, but sometimes were granular masses, similar in shape and appearance to the bodies found in the protoplasm of the epithelial cells. This can best be seen by a reference to Plate III, Figs. 12, 14, 15, 16 and 17. As to their stained appearance, some take on a uniform blue colour, with perhaps a few granules, others are more granular, and lose the ringed appearance. In both cases the granules always stand out distinctly. These extra cellular ring-shaped bodies are usually

found associated with the intracellular Trachoma Bodies, and occur with greater frequency in the same specimen. In one case a large granular mass larger than the nucleus, with six ring shaped bodies in its interior, was observed inside an epithelial cell, Plate III, Fig. 13. In another case fifteen ring bodies were found similarly situated, Plate III, Fig. 12. Both stained with methylene blue.

III. In addition to the signet ring bodies a number of very fine granules about 0.25 μ in diameter, some smaller, were nearly always present scattered throughout the specimen. They stained a pink colour with Giemsa, Plate IV, fig. 22.

IV. Specimens fixed with heat and stained with Löfflers Methylene Blue for ten minutes, showed the same structures, i.e. intracellular trachoma bodies, extra cellular signet ring bodies and free granules. All these were stained a blue colour. See Plate III, Figs. 12, 13 and 14.

RESULT OF MICROSCOPICAL EXAMINATION

OF CONJUNCTIVAL SCRAPINGS

TABLE V.

Appearances found	Giemsa. 3% for 24 hours		Löfflers Methylene Blue 10 mins.	
	No. of cases	No. of times present	No. of cases	No. of times present
Free, Signet Ring shaped Bodies: staining Blue	+49	44	13	13
Very fine Granules Free, staining pink (2) Blue with Löffler	49	42	13	12
Trachoma Bodies in the Epithelial cells	49	46	13	13
From 1908 to 1911 at Tientsin, North China.				
Signet Ring Bodies 20	20 old 28 early	0 24		
Free Granules 20	20 old 28 early	0 20		
Trachoma Bodies in the Epithelial Cells 20	20 old 28 early	10 25		

N.B. + Of the above 49 cases, 13 were stained with Löfflers Methylene Blue.

RESULT OF BACTERIOLOGICAL & MICROSCOPICAL EXAMINATION OF TEN CASES OF OPHTHALMIA NEONATORUM

TABLE VI.

No. of Cases	Organisms & appearances found	No. of times found
10	Gonococcus	6
	Pneumococcus	2
	Bacillus Xerosis	4
	Bacillus (Morax-Axenfeld)	1
	Staphylococcus Albus	2
	" Citreus	1
	Trachoma Bodies) Stained	2
	Fine red granules free) with	2
	Free Signet Ring Bodies) Giemsa 3% 24hrs.	2

In six of these cases of Ophthalmia Neonatorum the Gonococcus was isolated in pure culture, no other organisms being found. I have not yet discovered the Trachoma Body associated with the Gonococcus.

In two cases, typical Trachoma Bodies were found, these specimens were stained with Methylene Blue, see Plate IV, fig. 18 and with Giemsa, Plate IV, fig. 19: Bacillus Xerosis, Pneumococci and Staphylococci, but no Gonococci were found on the culture.

TABLE VII.

I also examined with Giemsa's stain

20 cases diagnosed clinically as Koch Weeks conjunctivitis

20 " " " " Morax Axenfeld "

10 " Normal conjunctivae.

In none of these cases could I find Trachoma Bodies or signet ring bodies either free or in the epithelial cells.

From the Microscopical Examination will be observed:-

I. The great constancy of Trachoma Bodies, Signet Rings and free granules.

II. That they are practically always found together.

III. That they are much more frequently found in the early stages of Trachoma, than in the later stages when ciccatrices have formed.

IV. That they do not require any special stain to demonstrate their presence.

V. That they are much more frequently present than any of the well-known organisms of the conjunctiva.

PLATE. I

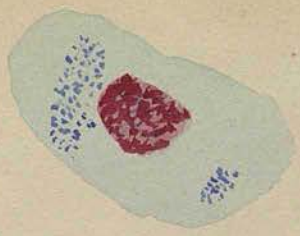

Fig. 1

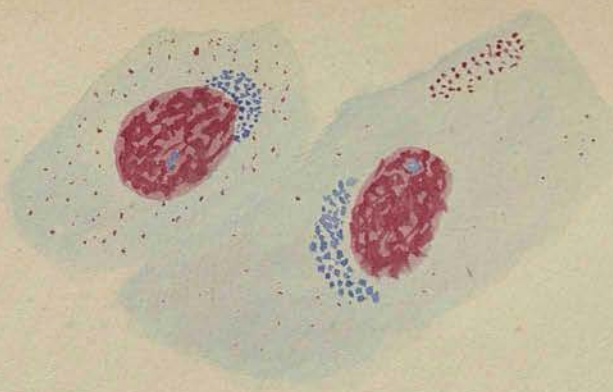

Fig. 2.

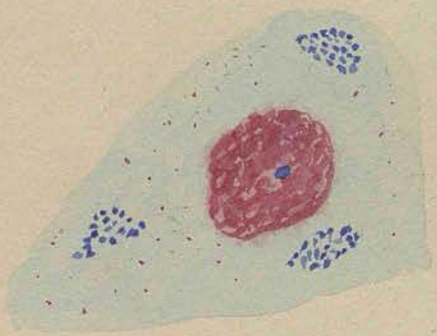

Fig. 3

Fig. 4

Fig. 5

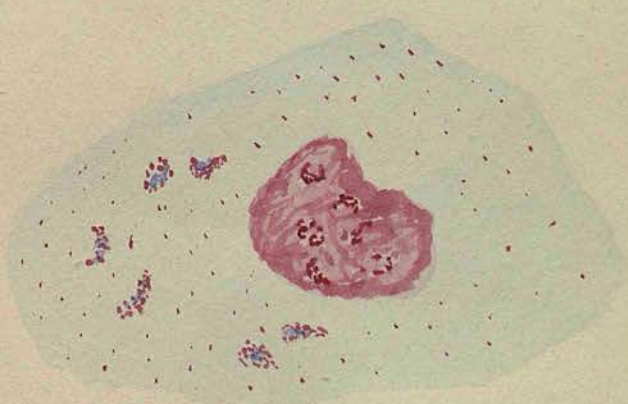

Fig. 6

JOHNS

PLATE II

Fig. 7

Fig. 8

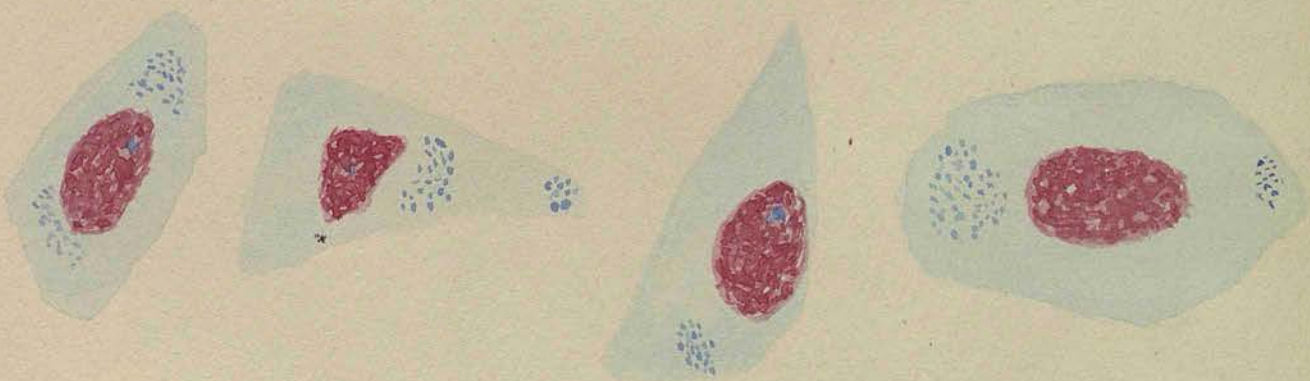

Fig. 9.

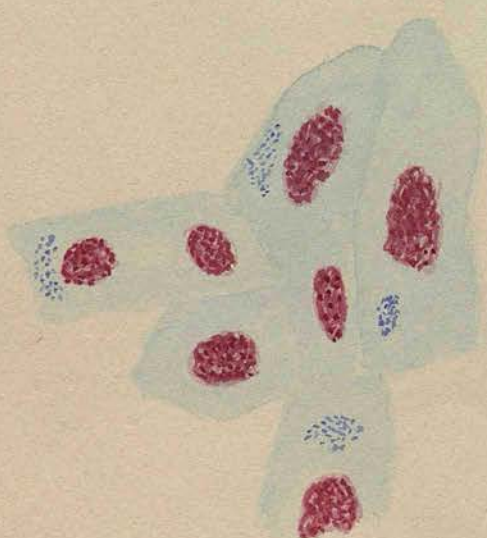

Fig. 10

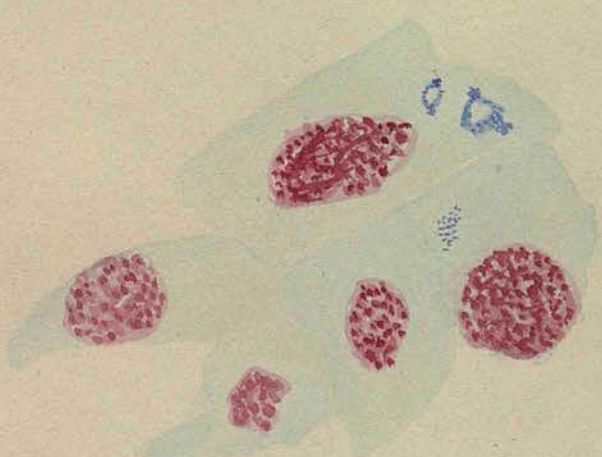

Fig. 11

JWHB

PLATE III

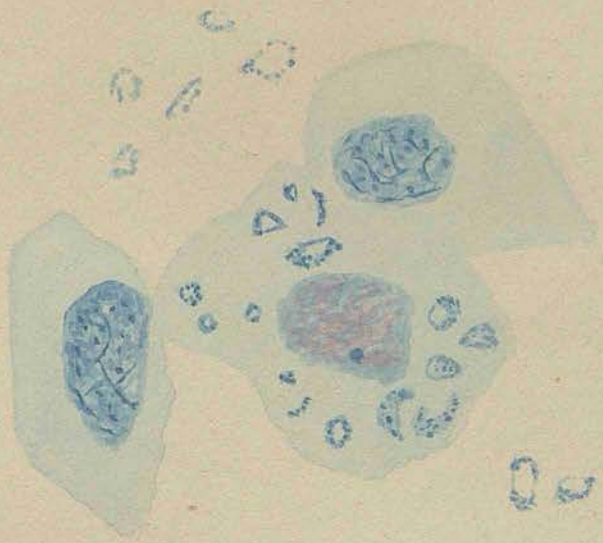

Fig. 12.

Fig. 13

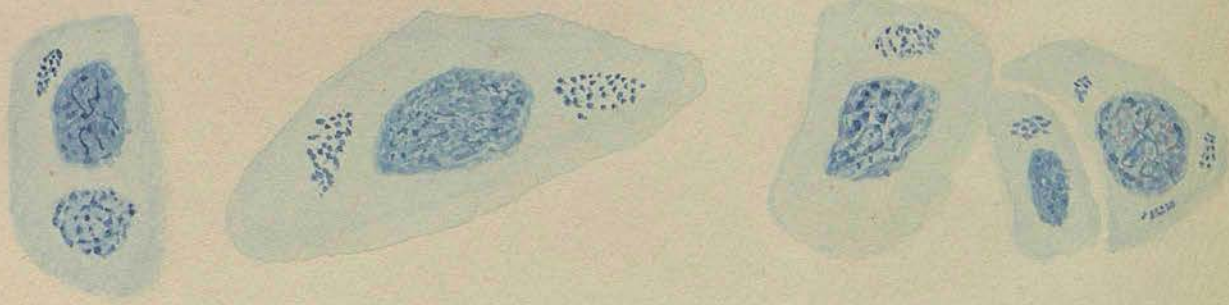

Fig. 14.

Fig. 15

Fig. 16

Fig. 17

JWHB

PLATE IV

Fig. 18

Fig. 19

Fig. 20 Fig. 21 Fig. 22.

VI. From Table VII that I have not found Trachoma Bodies or Signet Rings in the normal conjunctiva or any other affection of it, except in Trachoma.

S U M M A R Y

In reviewing the various Aetiological factors that have been mentioned, and from my own observations, I have come to the following conclusions:-

I. That Trachoma is a contagious disease.

II. That the contagion is in the conjunctival discharge and is generally distributed by the following means:-

Personal contact.

People sleeping together and using the same pillows and bed linen.

Using the same towels and washing utensils. Cases No. 12, 13, 14, 15 and 29 illustrate these points.

Flies, especially in tropical climates, where owing to the habits of the people they have special facilities for becoming infected.

Want of cleanliness.

Overcrowding.

Dust assists in the spread, by keeping up irritation and increasing the amount of the discharge.

III. That it is not air borne or directly the result of living under tropical conditions or due to heat and dust, is proved by Europeans living in the midst of it, yet not contracting the disease and further exemplified by the fact that it is now practically unknown in the British Army abroad.

IV. That it thrives best in warm climates assisted by heat, dust and flies, and by the habits and prejudices of the races that inhabit these parts.

V. That altitude affords protection in that the inhabitants are more or less removed from the general commercial route and intercourse with infected people. But when once the disease has been introduced it can flourish as well as at the lower elevations.

VI. That it is influenced by commerce in so far that it brings races into more intimate contact, and so the disease is found to be more prevalent in large towns, seaport towns and along the valleys of large rivers.

VII. That the causative agent must be able to exist at temperatures varying within wide limits.

IX. There is no Racial Immunity.

X. That the Trachoma Bodies are found in the epithelial cells in the very early and middle stages of the disease, and occur with such regularity as to be of great diagnostic value. As to their nature, I am unable to state as I have been unsuccessful in isolating or reproducing them under any condition. They are probably a stage of the Signet Ring Body.

XI. That the Signet Ring Bodies found free in the secretion and associated with the intra-cellular Trachoma Bodies, are also almost constantly present and of equal importance. Their exact nature is doubtful, but from the appearances recorded, see Plate III, Figs. 12 and 13, also Plate II, Fig. 11, it is probable that they enter the epithelial cells, multiply and finally rupture the cell, and so set free to commence the cycle again.

XII. That the free granules are frequently present, and their nature is problematical. I have been unable to cultivate them on the media on which Gonococci flourish. They may be some special organism or result from the disintegration of the Signet Ring Bodies, the intracellular Trachoma Bodies or the nuclei of the epithelial cells. Their metachromatic re-actions may be due to some intra-cellular or

extra-cellular charges they undergo. I have not found them in old cases of Trachoma. They are not deposit of stain.

XIII. That Ophthalmia Neonatorum in which Gonococci are found, is a separate and distinct disease from that in which Trachoma Bodies are present.

XIV. That Trachoma Bodies are not found in conjunctival affections other than Trachoma, also they are not present in the normal conjunctiva.

Finally that although I have been unable to prove any definite cause of Trachoma, yet I have shown that if no Aetiological significance can be attached to the intra-cellular Trachoma Bodies, Signet Ring Bodies or Free Granules; their presence is very constant and of great assistance in diagnosing early cases of this disease.

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o.	Date 1912:	Name	Age	Sex	History	Place of Infection	Previous Treatment.	Duration	LIDS: Lachrymation	Photophobia	Pain	Drooping	Thickening	Entropion	Ectropion	Trichiasis
1	7 Feby.	William Molford	years 14	M.	Eyes have been sore for 5 weeks	At Anerley School North Surrey District	Boric Lotion Ung-Hydrarg.oxidi Flav.	5 weeks	+	+	+ in the eye	o	+[1]	o	o	o
2	7 Feby.	William Kimble	12	M.	Eyes have been sore for 3 weeks	Anerley School, N.Surrey District	Boric Lotion,Ung-Hydrarg,oxidi Flav.	3 weeks	+	+	+ in the eye	o	+	o	o	o
3	7 Feby.	Leslie Watt	9	M.	Sore eyes 5 weeks	Anerley School	Boric Lotion,Ung-Hydrarg,oxidi Flav.	5 weeks	+	+	+ in the eye	+[2]	+	o	o	o
4	7 Feby.	Percy Stanhope	8	M.	Sore eyes 1 year	Anerley School	Boric Lotion,Ung-Hydrarg,oxidi Flav.	1 year	+	o	o	o	+	o	o	o
5	7 Feby.	Elsie Beere	10	F.	Sore eyes 2 months	Anerley School	Boric Lotion,Ung-Hydrarg,oxidi Flav.	2 mths.	+	+	+ in the eyes	o	+	o	o	o
6	7 Feby.	Bessie Judd	6	F.	Sore eyes some weeks,came on gradually - no family history - at school	Anerley School	Boric Lotion,Ung-Hydrarg,oxidi Flav.	o	+	o	o	o	o	o	o	o
7	7 Feby.	Dorothy Phillips	13	F.	Sore eyes about 10 weeks - no family history - at school	Anerley School	Boric Lotion,Ung-Hydrarg,oxide Flav.	10 weeks	+	+	o	o	+	o	o	o
8	7 Feby.	Nelly Crisp	11	F.	Uncertain	Anerley School	Boric Lotion,Ung-Hydrarg,oxidi Flav.	o	+	+	o	+	+	o	o	o
9	7 Feby.	Alice Lennox	12	F.	Sore eyes 8 weeks no family history at school	Anerley School	Boric Lotion,Ung-hydrarg,oxidi Flav.	8 weeks	+	+	o	+	+	o	o	o
10	7 Feby.	Alice Bray	11	F.	Sore eyes 10 weeks no family history at school	Anerley School	Boric Lotion,Ung-Hydrarg,oxidi Flav.	11 weeks	+	+	+	o	o	o	o	o
11	7 Feby.	Florence Brown	11	F.	Sore eyes 11 weeks no family history	Anerley School	Boric Lotion,Ung-Hydrarg,oxidi Flav.	11 weeks	+	+	+	o	o	o	o	o
12	7 Feby.	James Day	5	M.	Has a sister and brother affected sleeps with his sister Alice,all lived together before going to the Hospital	Board School at Stepney.	Boric Lotion,Ung-Hydrarg,oxidi Flav.	3 weeks	o	o	o	o	o	o	o	o
13	Feby.	Alice Day	8	F.	First affected in the family, sleeps with her brother James - Mother's eyes supposed to be healthy	Board School at Stepney	Boric Lotion,Ung-Hydrarg,oxidi Flav.	6 weeks	+	+	o	+	+	o	o	o
14	Feby.	Mary Day	10	F.	3rd affected in the family does not sleep with others but uses the same towel and washing arrange-ments	Board School at Stepney	Boric Lotion,Ung-Hydrarg,oxidi Flav.	3 weeks	o	o	o	+	+	o	o	o

LIDS					CORNEA						CONJUNCTIVA																				
											HYPERTROPHY						TRACHOMA FOLLICLES							TARSAL CICATRICES					
											TARSAL		RETRO-TARSAL																	
Drooping	Thickening	Entropion	Ectropion	Trichiasis	Pannus	Leucoma	Ulceration	Iritis	Xerophthalmos	Eyes affected	Upper Right & Left	Lower Right & Left	Upper Right & Left	Lower Right & Left	Tarsal T.	Retrotarsal R.	Upper Right & Left	Lower Right & Left	Elementary	Large	Mixed	Upper Right & Left	Lower Right & Left	Scleral Injection	Subcutaneous vessels of upper lid dilated	Discharge
o	+1	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	T+	R+	+R +L	o o	+	o	o	o	o	+	R L	MP
o	+	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	To	R+	+R +L	+R +L	+	o	o	o	o	+	R L	MP
+2	+	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	T	R+	+R +L +R +L	o +R +L	+ +			o o	o o	+	+ R L	MP
o	+	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	To	R+	+R +L	+R +L		+	o	o	o	o	+	+ R L	MP
o	+	o	o	o	o	o	o	o	o	R L	+R +L	o o	+R +L	+R +L	To	R+	+R +L	+R +L	+	o	o	o	o	+	+ R L	MP
o	o	o	o	o	o	o	o	o	o	R L	+R +L	o o	+R +L	+R +L	To	R+	+R +L	o o				o	o		+ R L	MP
o	+	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	To	R+	+R +L	+R +L	+			o	o	+	+ R L	MP
+	+	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	To	R+	+R +L	o o	+			o	o	+	+ R L	MP
+	+	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	T+	R+	+R +L +R +L	+R +L	+			o	o	+	+ R L	MP
o	o	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	To	R+	+R +L	+R +L	+					2 +	+ R L	MP
o	o	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	T	R+	+R +L	+R +L	+					+ R L	+ R L	MP
o	o	o	o	o	o	o	o	o	o	R L	+R +L	o o	+R +L	+R +L	T+	R+	+R +L	+R +L	+					+ R L	+ R L	MP
+	+	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	T+	R+	+R +L +R +L	+R +L +R +L	+		+			+ R L	+ R L	MP
+	+	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	To	R+	+R +L		+		+				o	MP

No.	Date 1912	Name	Age	Sex	History	Place of Infection	Previous Treatment.	Duration	Lachrymation	Photophobia	Pain	LIDS: Drooping	LIDS: Thickening	LIDS: Entropion	Ectropion	Trichiasis
15	16 Feb	Mrs Rose Lang	49 years	F.	Eyes have been troubled since infancy. Had purulent discharge for many years. Got better when about 17 years kept good for 15 to 28 years, then broke out again: V.A. R 6/60 L 6/24	Unknown	Boric Lotion, Ung-Hydrarg, oxidi Flav	49 years	+	+	+	+	+	+	o	+
16	Feb.	?	20 years	M.	Eyes have been troubling for some time, did not pay much attention to them	Came on gradually	Lotions, Liniments,	?	+	+	o	+	+	o	o	o
17	Feb.	?	10 years	M.	Was sent for admission to Metropoliton Board Asylum Schools		Lotion and Ointment	2 mths	+	+	+	+	+	o	o	o
18	Feb.	Ethel Clarke	3 years	F.	Eyes have been sore for some time	School at West Ham	Lotion Ointment	?	+	+	+	+	+	o	o	o
19	Feb.	Eliza Madd Brown	11 years	F.	Had been at Webbs Cross Workhouse School for a year previously at Jupp Rd. School	Stratford	Lotion Ointments	4 years	+	o	o	+	+	o	o	o
20	Feb.	James Robertson	7 yrs	M.	Came from Webb Cross Infirmary	Unknown	Lotions Ointment	3 years	+	+	o	+	+	o	o	o
21	March	Charles Buck	17 years	M.	Eyes have been sore since birth, one sister aged 15 has also sore eyes, both use same towels, has 6 sisters.	3 Dryden Street, W. Croydon, leather cutter	none for the last year, previously ointments and lotions	17 years	+	+	+	+	+	+	o	+
22	March	Bessie Stranock	11 years	F.	Eyes sore 18 mths acute attack two months ago. Has been at "Barts" for 3 weeks treated with Protargol daily now going to Brentwood School	Birth place Poplar Has one sister aged 7 - no eye trouble.	Treated with Protargol for 3 weeks	18 mths	+	+	+	+	+	o	o	o
23	March 10th	Frederick Burke	3 years	M.	Unknown	Parish of Whitechapel, born at 2, Wheeler Street, E.	?	?	+	+	?	+	o	o	o	o
24	March 14th	Dorothy Stannard	4½ years	F.	Unknown	Parish Shoreditch from Cottage Home Hornchurch	?	?	+	+	?	+	+	o	o	o
25	March 18th	Jessie Richardson	11 yrs	F.	Eyes have been sore some time No family history.	Parish of Islington at St. Mary School, Hornsby	Ointment Lotions	3 mths	+	+	Slight	o	o	o	o	o
26	March 19th	G. Lewis	11 years	M.	Eyes have been sore since birth, 2 brothers and 2 sisters said to have no eye trouble	17, Heaneage St., Brick Lane, E. School Boy	Lotion Boric, Ung-Atropinal three days	since birth	+	+	o	+	+	o	O	O

LIDS			CORNEA						CONJUNCTIVA																				
									HYPERTROPHY					TRACHOMA FOLLICLES								TARSAL CICATRICES							
									TARSAL		RETRO-TARSAL																			
Drooping	Thickening	Entropion	Ectropion	Trichiasis	Pannus	Leucoma	Ulceration	Iritis	Xerophthalmos	Eyes affected	Upper Right & Left	Lower Right & Left	Upper Right & Left	Lower Right & Left	Tarsal T.	Retrotarsal R.	Upper Right & Left	Lower Right & Left	Elementary	Large	Mixed	Upper Right & Left	Lower Right & Left	Scleral Injection	Subcutaneous vessels of upper lid dilated	Discharge
+	+	+	o	+	+	+	o	o	o	R L	nil	nil	nil	nil	To	R+	R+ L+ a few	o		+		+ R +L	+R +L	+ R L	+ R L	MP
+	+	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	T	R	+R +L +R +L	+R +L +R +L		+ +		+R +L	+R +L	+ R L	+R	MP
+	+	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	T	R	+R +L +R +L	+R +L +R +L	+	o	o	o	o	+	+	MP
+	+	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	T	R	+R +L +R +L	+R +L +R +L	+			o	o	+ R L	+ R L	MP
+	+	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	T	R	+R +L +R +L	+R +L +R +L			+	+R +L		+ R L	+ R L	o o
+	+	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	T	R	+R+L +R+L	+R+L +R+L			+	+R +L		o o	+R +L	MP
+	+	+	o	+ old+ next upper	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	T	R	+R+L +R+L	+R+L +R+L			+	+R +L	o o	+ R L	+R +L	MP
+	+	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	T	R	+R+L +R+L	+R+L +R+L	+		+	o	o	o	+R +L	MP
+	o	o	o	o	o	o	o	o	o	R L	+R +L		+R +L		T	R	+R+L +R+L		+		o	o	o	+R +L	+R +L	MP
+	+	o	o	o	o	o	o	o	R	+R	+R	+R	+R	T R	+R +R	+R +R	+			o o		+R	+R	MP
o	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	T	R	+R+L		+	o	o	o	o	o	+R +L	MP
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No.	Date 1912	Name	Age	Sex	History	Place of Infection	Previous Treatment	Duration	LIDS: Lachrymation	LIDS: Photophobia	LIDS: Pain	LIDS: Drooping	LIDS: Thickening	LIDS: Entropion	Entropion	Trichiasis
27	March 19th	G. Treademay	16 years	M.	Eyes have been sore since Xmas 1911, no pain, may have been sore previously	19, Brinsbury Rd., Islington, B-Place unknown, occupation nil.	Has been using Lotions one week	3 mths	+	o	+	+	+	o	o	o
28	21	James Davie	8½ years	M.	Eyes have been sore last 2 months stick in the morning, no family history	North Surrey District School, B-Place unknown School Boy	Lotions 2 weeks	2 mths	+	o	o	o	+	o	o	o
29	21	Lilian Meadows	19 years	F.	Never had sore eyes. Has 3 sisters and 2 brothers.The 2 sisters have had sore eyes,now cured. 1st sister about 3 months ago now cured 2nd sister about 3 weeks after youngest was affected,also cured 2 brothers:sore eyes now cured. Mother: same time as 2nd sister,eyes still sore.Patient sleeps with her youngest sister who was first affected, all use separate towels, but the same wash basin.	Sunshade maker 7 Henry Street, Old Street, E.C.	Lotion	1 mth.	+	+	+	o	+	o	o	o
30	23	Benjamin Gillowitz	11 years	M.	No History	School boy	Lotions	4 mths	+	+	+	+	+	o	o	o
31	25	Ethel Tilbury	10 years	F.	nil	Unknown	Lotions	3 mths	+	+	+ in the eye	+	+	o	o	o
32	29	Harold Hogg	15 years	M.	Eyes have been sore last six months, feels like sand in them sometimes.	Unknown	Lotions	6 mths.	+	+	+ in the eyes	+	+	o	o	o
33	3 April	Harry Henderson	12 years	M.	Sight has been sore off and on for over 1 year	School boy, 54,Lincoln Street, Bow, E.	Lotions	1 year	+	+	+ in the eye R.	+	+	o	o	o
34	15	Mary Nunning	14 years	F.	Eyes have been sore a long time, all children provided with separate towels and washing arrangements	at Hammersmith Nazareth Home School	Silver Nitrate and Boric Lotion	1 year	+	+	o	+	+	o	o	o
35	15	Ellen Iris Lucas	12 years	F.	Eyes have been sore over a year	at Hammersmith Nazareth Home School	Silver Nitrate and Boric Lotion	1¼ year	o	o	o	+	+	o	o	o
36	15	Alexandria Ness	12 years	F.	Has been suffering from sore eyes about 1 year,along with several children of the same school	at Nazareth Home, Hammersmith	Boric Lotion and silver Nitrate	12 mths	+	o	o	+	+	o	o	o

LIDS		CORNEA						CONJUNCTIVA																	
								TARSAL		RETRO-TARSAL		TRACHOMA FOLLICLES								TARSAL CICATRICES					
Thickening	Entropion	Entropion	Trichiasis	Pannus	Leucoma	Ulceration	Iritis	Xerophthalmos	Eyes affected	Upper Right & Left	Lower Right & Left	Upper Right & Left	Lower Right & Left	Tarsal T.	Retrotarsal R.	Upper Right & Left	Lower Right & Left	Elementary	Large	Mixed	Upper Right & Left	Lower Right & Left	Scleral Injection	Subcutaneous vessels of upper lid dilated	Discharge
+	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	T	R	+R+L +R +L	+R +L +R +L	+	+		R + L o	o o	+	R + L	MP
+	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	T	R	+R+L +R+L	+R+L +R+L	+	+		o o o o	o o o o	+	L + R	MP
+	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	T	R	+R +L +R +L	nil nil	+			o o	o o	+	+ R L	MP
+	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	T	R	+R+L +R+L	nil nil	+		+	o o	o o	+ +	+ R L	MP
+	o	o	o	o	o	o	o	o	R L	+R +L		+R +L		T	R	+R+L +R+L	+R+L +R+L	+		+	o	o	o	+	MP
+	o	o	o	o	o	o	o	o	R L	+R +L		+R +L		T	R	+R+L +R+L		+		+	o o		o o	+	MP
+	o	o	o	o	o	o	o	o	R L	+R	+R	+R +L	+R	T	R	+R +R+L	+R +R	+		+	+R	+R	+	+	MP
+	o	o	o	o	o	o	o	o	R L	+R +L		+R +L		T	R	+R +L +R +L		+		+	o	o	o	+	MP
+	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	T	R	+R+L +R+L	+R+L +R+L	+			6 o	o o	+	+	MP
+	o	o	o	o	o	o	o	o	R L	+R +L	+R +L	+R +L	+R +L	T	R	+R+L +R+L	+R+L +R+L	+		+	o	o	o	+	MP

											LIDS				
No.	Date	Name	Age	Sex	History	Place of Infection	Previous Treatment	Duration	Lachrymation	Photophobia	Pain	Drooping	Thickening	Entropion	Ectropion	Trichiasis
37	15 April	Annie Woolley	11 years	F.	Has been suffering from sore eyes over a year as other children in the school	at Nazareth Home Hammersmith These children have all been under treatment	Boric Lotion Silver Nitrate	1½ years	o	o	o	+	+	o	o	o
38	15	Agnes Gladys Ellis	12 years	F.	Sore eyes for one year, affected same time as other children at the school	at Nazareth Home Hammersmith	Boric Lotion and Silver Nitrate	1 year	+	o	o	+	+	o	o	o
39	15	Maud Norris	14 years	F.	Eyes have been sore for over a year	at Nazareth Home Hammersmith	Boric Lotion and Silver Nitrate	1½ year	+	o	o	+	+	o	o	o
40	15	Pose Turlin	13 years	F.	Eyes have been sore for 9 months and show signs of argyrosis from treatment	at Nazareth Home Hammersmith	Boric Lotion and Silver Nitrate	9 mths	+	+	+	+	+	o	o	o
41	15	Gladys Kale	12 years	F.	Eyes have been sore for a year	at Nazareth Home Hammersmith	Lotion Boric and Silver Nitrate	1 year	o	o	o	o	+	o	o	o
42	19	L.Lemenlin			not	recorded										
43	19	John Seamell			"	"										
44	22	G.Clark			"	"										
45	26	Annie Carter			"	"										
46	27	George Talbot			"	"										
47	29	Lily Clarke			"	"										
48	2 May	Sydney Dodge			"	"										
49	"	John Sternings			"	"										

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